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| **Overall Expectations** | | **Specific Expectations** |
| A1. Demonstrate scientific investigation skills (related to both inquiry and research) in the four areas of skills (initiating and planning, performing and recording, analysing and interpreting, and communicating)  D3. Demonstrate an understanding of chemical components of and energy in food, and the processes by which food is digested  D2. Investigate chemical components of and energy in food, and the processes by which food is digested  F3. Demonstrate an understanding of biological processes related to biotechnology and of applications of biotechnology in the health, agricultural, and environmental sectors    F2. Investigate various techniques used in biotechnology and how they are applied in the food industry and the health and agricultural sectors | | A1.1 Formulate relevant scientific questions about observed relationships, ideas, problems, or issues, make informed predictions, and/or formulate educated hypotheses to focus inquiries or research  A1.2 Select appropriate instruments (e.g., sampling instruments, a microscope, a stethoscope, dissection instruments) and materials (e.g., dichotomous keys, computer simulations, plant cuttings), and identify appropriate methods, techniques, and procedures, for each inquiry  A1.4 Apply knowledge and understanding of safe laboratory procedures when planning investigations by correctly interpreting Workplace Hazardous Materials Information System (WHMIS) symbols; by using appropriate techniques for handling and storing laboratory equipment and materials and disposing of laboratory and biological materials (e.g., preserved specimens); and by using appropriate personal protection  A1.8 Synthesize, analyse, interpret, and evaluate qualitative and/or quantitative data to determine whether the evidence supports or refutes the initial prediction or hypothesis and whether it is consistent with scientific theory; identify sources of bias and/or error; and suggest improvements to the inquiry to reduce the likelihood of error  D2.3 Investigate how enzymes break down macromolecules, and test the products of different types of digestion  D3.3 Describe requirements for a balanced diet based on the biochemical and energy needs of the average body, and explain how these requirements might vary among people with different lifestyles  F3.1 Explain various methods used, over time, in the field of biotechnology  F2.4 Investigate, through laboratory inquiry or computer simulation, a recently developed biotechnological method used in the field of agriculture  F2.2 Plan and conduct an inquiry into various traditional biotechnological techniques used in the food industry |
| **Concepts** | | |
| **Terminology** | | **Theory** |
| * pH * Enzyme * Temperature * Coagulation | * Acid * Base * Macromolecule * Protein | * Acids and bases * Enzymes * Denaturation factors for proteins |
| **Material to prepare** | | |
| Scenario   * Copy of activity * Copy of assessment grid   Activity   * Computer for research and planning protocol * Material according to the type of evaluation suggested  |  |  | | --- | --- | | Material | Perishable | | Graduated pipette 0.5 and 1.0 mL  Dropper  Hot plate + beaker or heating bath  Thermometer  Test tube or 20 mL test tube  Stopwatch  Test tube holder  pH paper or pH meter  Funnel  Cheesecloth or filter paper  Spatula  Graduated cylinder | Animal rennet  Vegetable rennet  Chymosin produced by fermentation  Lemon juice  Acetic acid 5%  Sodium bicarbonate solution 5%  10% cream  Whole milk  0% milk  Ice  Distilled water  Parafilm |   Pushing further   * Computer for analysis and report | | |
| **Scenario**   * Video, steps of cheese production: curdling, enzyme action * Raw materials needed to make cheese * Presentation of the work * Research and selection of the variable to study | | |
| **Activity — part 1 — Planning**   * Group the students * Divide the work tables according to the selected variables * Students complete the laboratory protocol. [hypothesis, material and method] * Approve the protocol before lab day   **Activity — part 2 — Experiment**   * Make sure the students follow the approved instructions | | |
| **Pushing further**  Pool the results to determine the criteria to combine in order to achieve the best yield  Conduct a verification laboratory to verify the choice of optimal coagulation factors | | |
| **Assessment**   * Summative: writing in the material and method section * Summative: laboratory work — laboratory report | | |
| **Ressources**   * Protocol example * Equipment supplier   Internet   * [Replacing chemical preservatives with functional biofilm with antiviral, antioxydant and bioreactive properties.](https://www.cbc.ca/news/canada/nova-scotia/cape-breton-researchers-looking-into-plastic-that-kills-covid-19-1.5633150)   [[*https://www.cbc.ca/news/canada/nova-scotia/cape-breton-researchers-looking-into-plastic-that-kills-covid-19-1.5633150*](https://www.cbc.ca/news/canada/nova-scotia/cape-breton-researchers-looking-into-plastic-that-kills-covid-19-1.5633150)*]*   * In search of a natural solution against spoilage bacteria and pathogens in poultry and frozen vegetable products [<https://canadianfoodinnovators.ca/project/in-search-of-a-natural-solution-against-spoilage-bacteria-and-pathogens-in-poultry-and-frozen-vegetable-products>] | | |